Matrix Autologous Chondrocyte Implantation (MACI) of the Patellofemoral Joint Rehabilitation Protocol

General Notes:

As tolerated should be understood to include with safety for the surgical procedure; a sudden increase in pain, swelling, or other undesirable factors are indicators that you are doing too much too soon. If any of these occur, decrease activity level and ice.

During rehabilitation if there are any neurovascular findings please call the office.

Ice should be applied to the knee for 15-20 minutes following each exercise, therapy, or training session. Return to sport is based on provider team (physician, physician assistant, athletic trainer, therapist) input and appropriate testing.

All times and exercises are to serve as guidelines. Progression through the protocol should be based upon criteria as opposed to dates listed and will vary depending on each individual patient. Progress should be agreed upon by the patient and his/her team of providers.

Post-Operative Phase I: (Day 1-Week 3)

Goals:

• Minimize knee pain and inflammatory response
• Protect the integrity of the surgical repair
• Gradually restore pain free passive range of motion (PROM) within parameters

Brace/Weight Bearing:

• To be worn when ambulating with crutches
• Progress as tolerated to full weight bearing with brace locked in extension
  o Crutches to be used at all times until told not to by MD

PROM:

• Use of CPM – Begin 0-30 at the slowest speed
  o Progress 5 degrees per day as tolerated – discontinue once 90 degrees is achieved
  o Goal is 6 hours per day
• Knee ROM 0° to 90°

Therapeutic Exercises:

• Ankle pumps, towel calf stretch
• Heel prop for knee extension
• 4-way straight leg raises, quad sets

Cardio:

• UBE (arm bike)
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Modalities/Education:
  • NMES (neuromuscular electrical stimulation) for quadriceps atrophy
  • Cryotherapy 6-8 times per day for 15 to 20 minutes each

Manual:
  • Scar and soft tissue mobilization as needed
  • Careful and gentle patella and peri-patella soft tissue mobilizations

Progression to Phase II:
  • ROM 0° to 90°
  • Minimal joint effusion
  • Hip flexion straight leg raises without knee extension lag

Post-Operative Phase II: (Week 3-6)

Goals:
  • Minimize knee pain and inflammatory response
  • Protect the integrity of the surgical repair
  • Progress ROM

Brace/Weight Bearing:
  • Used when walking at all times
  • Opening of brace when weight bearing is started at week 4
  • Full weight bearing with brace locked in full extension
    • Progression of weight bearing with flexed knee allowed after week 4 depending on physiologic factors – effusion, ROM, strength

ROM:
  • Continue CPM – Progress to 90 degrees as tolerated – discontinue once 90 degrees is achieved
  • Knee ROM (do not force any painful motion)
  • Flexion - 0° to 90°

Therapeutic Exercises:
  • Ankle pumps, towel calf stretch
  • Heel prop for knee extension
  • 4-way straight leg raises, quad sets
  • Calf raises
  • Stationary bike for ROM without resistance after week 4, aqua therapy
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Proprioception:
• Seated proprioception training

Cardio:
• UBE (arm bike)
• Stationary bike without resistance

Modalities:
• NMES (neuromuscular electrical stimulation) for quadriceps atrophy
• Cryotherapy multiple times per day for 15 to 20 minutes each

Manual:
• Scar and soft tissue mobilization as needed
• Patella mobilizations

Progression to Phase II:
• Knee ROM 90°
• No effusion

Post-Operative Phase III: (Week 6-8)

Brace:
• Full weight bearing as tolerated with brace open to achievable ROM

ROM:
• Progress knee ROM to full flexion
• Extension - Full

Therapeutic Exercises:
• Ankle pumps, towel calf stretch, Heel prop for knee extension
• 4-way straight leg raises, quad sets
• Hip, core and gluteal strengthening
• Isometric quad strengthening

Proprioception:
• Weight shifting
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Cardio:
- UBE (arm bike)
- Stationary bike without resistance, treadmill, aqua therapy

Manual:
- Scar and soft tissue mobilization as needed
- Patella mobilizations

Modalities:
- Cryotherapy multiple times per day for 15 to 20 minutes each

Progression to Phase IV:
- Full Knee ROM
- No effusion
- Normal gait pattern
- No pain with weight bearing activities

Post-Operative Phase IV: (Week 8-12)

Weight Bearing:
- Full weight bearing

ROM:
- Full Knee ROM

Therapeutic Exercises:
- Closed kinetic chain multi-plane activities within pain free ROM
- Hip, core, and gluteal strengthening activities

Proprioception:
- Single limb stance, unstable surfaces
- BAPS board
- Perturbation training (balance against resistance or external forces)

Cardio:
- UBE (arm bike), Stationary bike, Treadmill ambulation, Elliptical
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Modalities:
• Cryotherapy after activity/therapy for 15 to 20 minutes each

Post-Operative Phase V: (Week 12 – 6 months)

Therapeutic Exercises:
• Closed kinetic chain multi-plane activities within pain free ROM
• Hip, core, and gluteal strengthening activities
• Initiate running at 3 months

Plyometrics (Begin after 4 months):
• Initiate double limb plyometrics at 4 months
• Progress as tolerated to single limb plyometrics

Cardio:
• UBE (arm bike), Stationary bike, Treadmill ambulation, Elliptical
• Initiate running

Sports:
• Low impact sports such as skating, cycling, etc, are permitted by 3 months as tolerated. Repetitive impact sports should be delayed until 4-6 months and then returned to on graduated basis provided no recurrent swelling occurs.
• Return to aggressive sports should be graduated and done after 6 months.

Return to Sport Phase:

Recommend pursuing Transitional Therapy for return to sport activities during this phase
• Transitional Therapy – a strength and conditioning program that is led by medical professionals with a sports medicine background with the goal of transitioning from therapy back to sport
• Contact Elite Sports Medicine for details

In addition to ongoing strength, balance, and cardio conditioning, initiate agility drills and sport-specific plyometric activities as tolerated such as:

Soccer/Football: 2 foot ankle hop, double-leg hop, front barrier hop, lateral barrier hop, single-leg hop, power skip, backward skip, double-arm alternate-leg bound, and cycled split squat jump
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**Basketball/Volleyball:** 2 foot ankle hop, double-leg hop, squat jump, double-leg vertical jump, single-leg hop, single-leg vertical jump, power skip, backward skip, double-arm alternate-leg bound, alternate-leg push off box drill, and side-to-side push-off box drill

**Baseball/Softball/Overhead throwing sports:** 2 foot ankle hop, double-leg hop, front barrier hop, lateral barrier hop, single-leg hop, power skip, backward skip, double-arm alternate-leg bound, cycled split squat jump, and return to throwing program

**1 year follow up testing:**

- Isokinetic testing to assess strength of hamstring/quadriceps
- Jump and hop testing